Foundation models for generalist medical artificial intelligence

Abstract

The exceptionally rapid development of highly flexible, reusable artificial intelligence (AI) models is likely to usher in newfound capabilities in medicine. We propose a new paradigm for medical AI, which we refer to as generalist medical AI (GMAI). GMAI models will be capable of carrying out a diverse set of tasks using very little or no task-specific labelled data. Built through self-supervision on large, diverse datasets, GMAI will flexibly interpret different combinations of medical modalities, including data from imaging, electronic health records, laboratory results, genomics, graphs or medical text. Models will in turn produce expressive outputs such as free-text explanations, spoken recommendations or image annotations that demonstrate advanced medical reasoning abilities. Here we identify a set of high-impact potential applications for GMAI and lay out specific technical capabilities and training datasets necessary to enable them. We expect that GMAI-enabled applications will challenge current strategies for regulating and validating AI devices for medicine and will shift practices associated with the collection of large medical datasets. This review discusses generalist medical artificial intelligence, identifying potential applications and setting out specific technical capabilities and training datasets necessary to enable them, as well as highlighting challenges to its implementation.